

**Sub(O)bject Make(R)s: How Do Make:Magazine® and Maker Faires® contribute in constituting biology as a personal technology?**

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# **Sub(O)bject Make(R)s: How Do Make:Magazine® and Maker Faires® contribute in constituting biology as a personal technology?**

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## **Abstract**

In 2005 O'Reilly Media Inc., one of the largest computer book publishers launched Make:magazine, a journal dedicated to the emergence of the modern DIY movement. Although the magazine is largely focused on electro-mechanical technologies, one year later, the editors published an issue entitled Backyard Biology.

Drawing on preliminary primary and secondary literature sources, interview and participant observations, this articles explores how Make:Magazine® and Maker Faires® contribute in constituting biology as a personal technology. It shows how elements of the magazine's editorial culture and the fair's community culture transmitted values and practices traceable to the techno-libertarian Californian's counterculture to the member of the DIYbio network.

## **Introduction**

This paper explores the role of limited but significant elements of Make: Magazine ®'s editorial culture and Maker Faires®'s community culture, in constituting biology as a personal technology. Although the phenomena the expression *re-constituting biology as a personal technology* attempts to capture, far exceeds the purpose of this exercise. By analyzing crucial biographical elements of its editorial board's leading figures, the first section attempts to place Make:magazine®'s editorial culture as part of "digital generation", that is, a part of a specific media tradition. The second section proposes a preliminary analysis of Make:magazine®'s Backyard Biology issue content and in particular how in it biology was redefined as a personal technology and link it to Make:magazine®'s mythical figure of the *maker*. Finally, as this work is part of a larger effort to describe the emergence of the DIYbio network, the third section discusses the increasing presence its members to Maker Faires® and how their participation allowed them to exercise their vision of a personal biology. Reflecting the episodic and preliminary nature of my fieldwork to date, this report is presented as a series of snapshots, which relations are still in the making as the DIYbio network emerges. We conclude by arguing that shedding some light on Make Magazine® publication culture and Maker Faire® community culture is an important chronological step to understand how *biology* could be framed as *DIYbio*.

## **First snapshot: Placing Make Magazine and its editorial board leading figures**

Make Magazine®'s first issue was released in January 2005. According to new media commentator Rex Hammock<sup>1</sup>, the start-up of the magazine was a "benchmark for how the blogosphere can help provide

<sup>1</sup> Rex Hammock is the founder of Hammock Inc. a "content marketing, strategy and media company founded in 1991" his influencing blog covers the magazine industry and custom publishing. Technocrati the second leading blog ranking company ranks Hammock blog 800'261 in the world with a Technocrati Authority of 443/1000, as comparison BoingBoing authority is ranked 829/1000 while Make:magazine is ranked 645/1000.  
<<http://technorati.com/blogs/www.rexblog.com/#ixzz1akc4O5a2>>

buzz-magic for a magazine launch". In this case, the use of blogosphere as an advertising space was entirely *natural* rather than *strategic*. Hammock explains that as Make:magazine's Editor in Chief Mark Frauenfeld had been previously known as *superstar bloggers*, "nothing about the use of blogs and bloggers in the launch of Make smacks of being "contrived" or "manufactured" or gimmicky"<sup>2</sup>. To understand what Hammock means by calling Mark Frauenfelder a *superstar blogger* and how this participated to Make:magazine (more commonly referred at a simply MAKE) editorial culture, it is important to trace some biographical elements of his life, including the moment when he joined MAKE as Editor in Chief.

Mark Frauenfelder became first known among followers of the cyberpunk subculture as the founder, with his wife Clara, of the zine BoingBoing. In an interview given in 1997, he recalls his former life as a specialized part engineer, "all the engineers knew each other by what parts they were designing. I was the motor guy. The engineer next to me was the flex lead guy"<sup>3</sup>. After several years he felt this situation was no longer bearable, "I needed some kind of creative outlet, so Carla and I decided to start a zine. We decided to explore the coolest, wackiest stuff we could think of, and came up with the name bOING bOING. Bouncing through our crazy world". In 1988, he swapped his extremely specialized engineering job with the hectic world of freelance zine writing and publishing, "I love zines because one person can be responsible for all 100 parts"<sup>4</sup>. In less than four years BoingBoing grew into a zine with a 17'000 copies distribution. In 1996, pioneering the blog boom, an enlarged BoingBoing editorial team inaugurated a blog with the same name. In 1997 the publication of the zine was dismissed to its online version, now consultable at *boingboing.net*. The zine and the blog have been influencing an entire generation by publishing articles and posts about self-publication, cryptography, nanotechnology, pirate radios, rocketry, bizarre forms of worship, cyberpunk literature and "a multitude of technology tricks to illuminate our daily life"<sup>5</sup>.

Meanwhile Mark Frauenfelder continued to develop his career as a freelance writer and illustrator working in particular for, what Fred Turner would define as techno-libertarian media such as Mondo2000, Wired, Wired Online, but also The Industry Standard. As it will become clearer in the last part of this section, many funding members and core authors of those media are in reality part of an interconnected social network, of which Mark Fraunfelder first became part and recently gave a voice in MAKE.

Finally, thanks to John Battelle friendship<sup>6</sup> in 2005 Mark Frauenfelder became Editor in Chief of MAKE. In his sixth and last book introduction, entitled "Made by Hand: Searching for Meaning in a Throwaway World", Mark explains how the job offer coincided with a second major turning point in his life. In 2003, as California's freelance-journalism's market was hit by the dotcom recession he and his wife decided to move out from the hectic and expensive life of Los Angeles<sup>7</sup>. They sold their house and car, and landed in Rarotonga, a "in the middle of nowhere"<sup>8</sup> 67 km<sup>2</sup> island in the South Pacific. During their neo-back-to-the-land experience, they learned "how to slow down and to take more

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<sup>2</sup> Hammock, R, 'MAKE and the secret of garnering magazine-launch media coverage in the blog age', on Rex Hammox's Blog, posted 17 March 2005, viewed on 11.09.2005, <<http://www.rexblog.com/2005/03/17/13762>>

<sup>3</sup> Rowe, C, "Mark Frauenfelder & Carla Sinclair, bOING bOING", in *The Book Of Zines*, 1997, viewed on 22 August 2011, <<http://www.zinebook.com/interv/boing.html>>

<sup>4</sup> Rowe, 1997.

<sup>5</sup> L. Courau, *Mutations pop et Crash culture: une anthologie de la Spirale.org*, Editions du Rouergue, 2004, p. 29-32.

<sup>6</sup> John Battelle is one of the original funders of Wired, CEO of the Industry Standard and funder of Federated Media Publishing the co-organizer of several O'Reilly Media Conferences. Viewed on 12 September 2011, <<http://battellemmedia.com/about-john>>

<sup>7</sup> M. Frauenfelder, *Made by Hand: Searching for Meaning in a Throwaway World*, Portofolio, 2004, pp. 1-2.

<sup>8</sup> Metger, 2010.

control over the system that kept us alive and well like food”<sup>9</sup>, to value how to bake their bread, pick up coconuts from the garden and spend the entire day cooking with the family. Although they planned to stay for a year, only four and a half months later they moved back to Los Angeles<sup>10</sup>. Their life resumed in an “over-caffeinated routine of school, work, driving, takeout meals and weekends filled with kiddie birthday parties at Chuck E. Cheese's”<sup>11</sup>. But as Mark was offered a job at MAKE, he progressively became involved with the *maker* community, “hanging out with people who do this not just with food but with everything”<sup>12</sup>. He started to keep bees and chickens, make his own yogurt, construct guitars out of cigar boxes and getting involved with “DIY education” of his children<sup>13</sup>. How he expressed in one of his new year resolutions, those *analogue* activities became his way to “unplug”, to “cut through the absurd chaos of modern life and find a path that was simpler, direct and clear”<sup>14</sup>.

What started as a family back-to-the-land experience shortly became what could be called a back-to-the-tool experience. To escape from the speed of the modern life it was no more necessary go far away as part of a commune, the experience of being unplugged could be lived within the walls of the familiar house and shared with wives and children<sup>15</sup>.

While becoming Editor in Chief of MAKE, Mark Frauenfelder continued to write on Boing Boing. On the occasion of MAKE's launch, he simultaneously mobilized Boing Boing's readers with the IT professionals' network assembled by MAKE's publisher O'Reilly Media Inc.

A limited but representative example took place on July 29<sup>th</sup> 2004, when Mark Frauenfelder wrote a post on BoingBoing blog entitled “New O'Reilly magazine: Make”. As usually in his posts, Mark Frauenfelder spoke at the first person to report how that same day he and Editor and Publisher Dale Dougherty announced MAKE's premiere at the third edition of OSCON - O'Reilly Open Source Convention in Portland, Oregon<sup>16</sup>.

Before describing the specific role of Editor and Publisher Dale Dougherty, some elements of O'Reilly Media Inc., MAKE's publisher, corporate culture and its CEO Tim O'Reilly will be introduced.

Funded in Boston in 1978, O'Reilly Media Inc., has since become a leading company in computer books publishing, with a special culture of corporate community<sup>17</sup>. Dale Dougherty who started his career as computer program book writer and early publisher of O'Reilly, recalls the atmosphere at O'Reilly Media Inc. as follows, “It was a mix of kindergarten and grownups - We had an aversion to the business world, and Tim had this alternative perspective that was very attractive”<sup>18</sup>.

In particular as it will become more clear in the section dedicated to the Maker Faire®, the

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<sup>9</sup> R Metzger, 'Boing Boing's Mark Frauenfelder: Made By Hand', 2010, viewed on 24 September 2011, <<http://vimeo.com/12534051>>

<sup>10</sup> Frauenfelder, p.3.

<sup>11</sup> Frauenfelder, p. 3.

<sup>12</sup> Metzger, 2010.

<sup>13</sup> Metzger, 2010.

<sup>14</sup> Frauenfelder, p.1.

<sup>15</sup> The expression back-to-the-land is used in reference to Fred Turner history of the communes as 'communities of consciousness'. In a divided America of the 60's, the back-to-the-land movement was motivated by the belief that a new society could only emerged by the spiritual transformation of its individual members, organized in small communes. Small technologies, including personal computers were embraced as tool for 'individual consciousness'. Following the post-communal disillusion of the 80s, the ideal community survived symbolically embedded in the network of wired personal computers and became the media of the 'digital generation'. F. Turner, *From Cyberculture to Counterculture, Steward Brand, The Whole Earth Catalogue and the Rise of Digital Utopianism*, The University of Chicago Press, Chicago and London, 2006, pp 73-78.

<sup>16</sup> M Frauenfelder, 'Make: O'Reilly New Magazine', in Boing Boing, 29 July 2004, viewed 12 September 2011, <<http://boingboing.net/2004/07/29/new-oreilly-magazine.html>>

<sup>17</sup> M Chafkin, 'The Oracle of The Silicon Valley, Inc.com, 1 May 2010, viewed 14 September 2011, <<http://allthingsd.com/voices/the-oracle-of-silicon-valley/>>

<sup>18</sup> Chafkin, 2010.

organization of conferences as social forums of production rapidly became a core component of O'Reilly Media Inc.'s corporate culture. In 2001 O'Reilly Media Inc. organized four conferences exclusively in the United States, while ten years later; the number has grown to twenty two conferences organized worldwide<sup>19</sup>.

Although OSCON is only one of the one-hundred worldwide conferences, organized by O'Reilly Media Inc., the event is among the most important conferences dedicated to the discussion and promotion of Open Sources practices within the IT professional community. The topic is symbolically bounded to the figure of Tim O'Reilly, whose leading understanding of the Open Source is based on the "architecture of participation", a principle inspired Mirch Kapor<sup>20</sup> maxim "[software] architecture is politics". In a paper entitled "Open Source Paradigm Shift" Tim O'Reilly wrote "the architecture of participation describes the nature of systems that are designed for user contribution"<sup>21</sup>. As such Tim O'Reilly vision of valuable technology is dependent from its build in possibility to gather a participative community around it.

On his Official Bio on O'Reilly Media Inc. website, CEO Tim O'Reilly is described as "a chronicler and catalyst of leading-edge development, honing in on the technology trends that really matter and galvanizing their adoption by amplifying "faint signals" from the "alpha geeks"<sup>22</sup> who are creating the future, while at the same time enjoying growing his own fruits and making his own jam.

His company first iconic success came with the publication of the Whole Internet User's Guide and Catalog (Krol, 1992). The book not only became a bestseller classic and designated as one of the New York Public Library's 100 Books of the 20th Century, but also it symbolizes the first expression of Tim O'Reilly techno-libertarian legacy to Steward Brand's Whole Earth Catalog.

In 2006 in a post written on O'Reilly Radar blog, to publicize the upcoming event entitled, "From Counterculture to Cyberculture: The Legacy of the Whole Earth Catalog", Tim O'Reilly suggested how such a legacy should be perpetuated "and of course, the Whole Earth Catalog is one of the wellsprings of the modern DIY movement, for which Make: magazine is now carrying the torch"<sup>23</sup>.

Even though overly simplified, Mark Frauenfelder and Tim O'Reilly contextual biographies shade some light on MAKE magazine editorial culture. Before reaching any conclusion, Editor and Publisher Dale Dougherty's role will be presented. Although less biographical, the section will focus on his choice of the *maker*'s figure.

In MAKE's first issue editorial, entitled "The Making of Make", Editor and Publisher Dale Dougherty explains, "Make: Magazine - Technology on your time, is a new magazine dedicated to showing how to make technology work for you. More than mere consumers of technology, we are makers, adapting technology to our needs and integrating it into our lives".

The figure of the *maker* Dale Dougherty infused the magazine with, dip into the mythical imagery of a American society united in, what becomes the almost spiritual act of manufacturing. In January 2011 at

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<sup>19</sup> On the company website the conferences are presented as an occasion to "create a collaborative space for alpha geeks and forward-thinking business leaders to come together to shape revolutionary ideas and translate the innovator's knowledge into useful skills and tools that can be applied to real world situations.". Viewed on 11 September 2011, <<http://conferences.oreillynet.com/>>

<sup>20</sup> Mirch Kapor is a leading software developer. Back in the 80s, his software Lotus 1-2-3 data sheet was the first billionaire sell software, as such Lotus 1-2-3 success participated in transforming the software sector in an independent industry and not as a subsidiary of the operating system and hardware industry, viewed on 11 September 2011, <<http://www.kapor.com/bio/index.html>>

<sup>21</sup> T. O'Reilly, 'Open Source Paradigm Shift', paragraph Network-enabled collaboration (as published as a blog entry not possible to give pages), Tim O'Reilly Radar, 2004, viewed 6 October 2011, <[http://tim.oreilly.com/articles/paradigmshift\\_0504.html#swcommod](http://tim.oreilly.com/articles/paradigmshift_0504.html#swcommod)>

<sup>22</sup> In Tim O'Reilly News From the Future column, published in MAKE, "alpha geeks" are defined as "people who are comfortable pushing the boundaries of technology, researchers and the kind of people who are called "hacker" in the computer world". T. O'Reilly, 'News from the future', Make:magazine, vol. 1, January 2005, p. 13.

<sup>23</sup> T. O'Reilly, 'The Legacy of the Whole Earth Catalog', *O'Reilly Radar Blog*, 2006, viewed 12 October 2011, <<http://radar.oreilly.com/2006/10/the-legacy-of-the-whole-earth.html>>

TED@MotorCity in Detroit<sup>24</sup> he shares a fragment of his inspiration: a collage film produced in 1960 by the Chevrolet division of General Motors and the Handy (Jam) Organization entitled “American Maker”. While a large view over a desert beach focus on two male children constructing a fortified sand castle, a typical 50s-60s male narrator’s voice explains “of all things Americans are, we are makers. With our strengths and our minds and spirit, we gather, we form, and we fashion -- makers and shapers and put-it-togetherers”<sup>25</sup>. As the image fades, Dale Dougherty attempts to actualize those images with his contemporary America “it was a sense of pride that we made things that the world around us was made by us, it was fairly commonplace to think of yourself as a maker” and as a closing remark “what will America make? It is more makers”<sup>26</sup>. As the verb “to make” is crafted into an embodied noun, the rather mythological and forgotten figure of the “American Maker” is brought up-to-date by making it operates the contemporary tools and technologies featured in the magazine. The American middle class D.I.Y culture is revitalized into the contemporary culture of 'personal fabrication'<sup>27</sup>.

Although a detailed content analysis of MAKE would be a requirement to establish more in dept conclusions. By biographically placing three of the MAKE’s editorial board leading figures, it is nonetheless possible to link MAKE to the information technology tradition of the Whole Earth Catalog and its successor magazine Wired. Sociologist Ronald Burt term of 'network entrepreneur'<sup>28</sup> well expresses how Mark Frauenfelder, Tim O'Reilly and Dale Dougherty crafted the magazine so to bring together 'an holistic media environment'<sup>29</sup>. While through the mythical figure of *the maker*, a new generation of leading institutional scientists, “world tinkers”, IT professionals, hackers, “drop out from specialization” artists, crafter, could continue to read themselves as part of a leading “community of consciousness” organized around a contemporary set of personal technologies<sup>30</sup>. The next two sections explores how biology as a technology was first inscribed as a *maker's* tool in MAKE and subsequently experience as on as part of the Maker Faires®.

## Second Snapshot: Crafting backyard biology as a personal technology for the techno-libertarian home

In this section we propose a brief content analysis of MAKE's Backyard Biology issue, published the 24<sup>th</sup> August 2006. By describing how language and visual elements are presented in the cover and the concerned articles, our aim is to address what is meant by *backyard biology*. How does an activity become *backyard biology* and how does this category perform as a connector to federate the experience of living matter as a media, to the actualized mythical figure of the *maker*.

Although the compound noun *backyard biology* has not been inscribed through a definition, the term has been used by actors in the field of education. In this context it refers to a subset of outdoor activities for children and young adults concerned with the scientific observation of living organisms and natural phenomenas in areas of proximity where urban and natural element coexist “It is not necessary to travel to exotic places to enjoy nature. Every backyard woodlot or neighborhood stream

<sup>24</sup> D Dougherty, 'We are makers', in TED, January 2011, viewed 7 August 2011, <[http://www.ted.com/talks/dale\\_dougherty\\_we\\_are\\_makers.html](http://www.ted.com/talks/dale_dougherty_we_are_makers.html)>

<sup>25</sup> Dougherty, 2011.

<sup>26</sup> Dougherty, 2011.

<sup>27</sup> N. Gerschenfeld, *Fab: The Coming Revolution on Your Desktop--from Personal Computers to Personal Fabrication*, Basic Books, 2007, p. 14.

<sup>28</sup> R. S. Burt, 'The Network Entrepreneur' In *Entrepreneurship: The Social Science View*, edited by Richard Swedbers, Oxford: Oxford University Press, 2000, pp.281-307.

<sup>29</sup> F. Turner, *From Cyberculture to Counterculture, Steward Brand, The Whole Earth Catalogue and the Rise of Digital Utopianism*, The University of Chicago Press, Chicago and London, 2006, p 72.

<sup>30</sup> Turner, p. 75, 2006.



abounds with living creatures with interesting stories to tell.”<sup>31</sup>. Finally in some rare cases the term is used as a synonym of particular citizen scientist's activities as part of wild life research projects<sup>32</sup> or to refer to conservation biology research projects studying the impact of gardens as repositories of biological diversity<sup>33</sup> and the causes of ecosystem invasion by non-native plants<sup>34</sup>.

The previous meaning of *backyard biology* has been briefly exposed; the following paragraphs address what is specifically meant by *backyard biology* in the context of MAKE.

The *backyard* as a place and a theme was part of MAKE since its first issue. As an example the column *Made on Earth: Report from the world of backyard technology*, published since the 1<sup>st</sup> edition of MAKE is entirely dedicated to the presentation of *the maker* culture as it extends to the domesticated exterior of the *backyard*<sup>35</sup>. The appropriative act of *making* marks the threshold where the different value between impersonal incoming objects and the personal home-made objects are negotiated<sup>36</sup>. After the basements, the workshops, the garages and the kitchens, the backyards is also celebrated as place of homemade personal production<sup>37</sup>.

Given this preamble how the category of backyard biology is used in MAKE?

The composition of the cover itself marks a first and important distinction. A zoomed image portrays two impersonal hands: one holding a lily while the other is holding a pair of tweezers near the lily's stamens, where the pollen is stored. The picture figures the act of removing the stamens - *emasculation* (*ouch*) as described by the editors, a sometime required step prior to the hand pollination<sup>38</sup>. If the choice of the impersonal hand is a classical way to represent the possibility to participate<sup>39</sup>, in this context the image is also a visual celebration of a new diversification of the act of “making”. This is a first for MAKE, the media upon which the act is performed is not an electro-mechanic device, but a colorful and imposing flower. For a magazine focused since its launch on electro-mechanical technologies *the maker* and the lily form a new and peculiar figurative pair whose relation needs to be explained. The image is therefore combined with the exhortation “hack your plants” followed by the proposal of “nine backyard biology projects”.

Hand pollination, a classical technique used in horticulture since the 19<sup>th</sup> Century<sup>40</sup>, becomes a “hack”

<sup>31</sup> Viewed 1 October 2011,

<<http://www.backyardbiology.net/aboutBYB.shtml>>

<sup>32</sup> M Reece, 'A Breakthrough in Backyard Biology Essex man gets \$260,000 grant for wildlife transmitter technology, growing interest in birdhouse mon', May 2011, *Flathead Beacon*, viewed 1 October 2011, <[http://www.flatheadbeacon.com/articles/article/a\\_breakthrough\\_in\\_backyard\\_biology/23145/](http://www.flatheadbeacon.com/articles/article/a_breakthrough_in_backyard_biology/23145/)>.

<sup>33</sup> G. Galluzzi; V. Negri, 'Contribution of backyard gardens to conservation of biological and cultural diversity and to human well-being', *Acta Horticulturae*, No. 881, 2010 pp. 179-183.

<sup>34</sup> A. Marco; S. Laverigne; T Dutoit, V Bertaudiere-Montes, 'From the backyard to the backcountry: how ecological and biological traits explain the escape of garden plants into Mediterranean old fields', *Biological Invasions*, Vol. 12, No. 4 2010, pp. 761-779.

<sup>35</sup> *Made on Earth*, viewed 24 October 2011,

<<http://makezine.com/made/>>

<sup>36</sup> The Oxford Dictionary definition of backyard includes a note on the informal usage of the term as “the area close to where one lives, regarded with proprietorial concern: children must be made aware of environmental issues in their own backyard”. Viewed 15 October 2011,

<<http://oxforddictionaries.com/definition/backyard>>

<sup>37</sup> MAKE Issue 18<sup>th</sup> “Re-make America” is where this ideal is the most explicitly expressed. The text presenting the issue states: “ReMake America! These challenging times have presented us with a rare chance to try out new ways of doing things. The opportunities for makers are terrific — we can start at home to remake manufacturing, education, food production, transportation, and recreation. In MAKE Volume 18 you'll learn how to make an automatic garden, heat your water with the sun, monitor and share your home energy usage, and more”. Viewed 13 October 2011,

<<http://makezine.com/18/>>

<sup>38</sup> Cover, *Make:Magazine*, Issue 7 Backyard Biology, 2006, O'Reilly Media Inc.

<sup>39</sup> F. Panese, 'Doctrine des signatures et technologies graphiques au seuil de la modernité'. *Gesnerus*, 60(1-2), 2003, pp. 6-24.

<sup>40</sup> J. Ardit, N. Adisheshappa and H. Nair, 'History-Pollination Hand-Pollination of Vanilla : How Many Discoverers?' *Orchid Biology: Reviews and Perspectives*, 2009, pp. 233-249.

and “hacking” plants becomes a *backyard biology* activity. The category of living as a media upon which a “hack” can be performed is further expanded from *plants* to *bugs* and *biology*<sup>41</sup>. At page 42, in the section entitled Proto, “Profiles of corporate makers who have managed to parlay their hacker sensibility into a career”, Drew Endy a leading figure of the emerging field of synthetic biology is portrayed<sup>42,43,44</sup>. The piece entitled “Garage Biotech” describes a Drew Endy irritated by bugs: “this object should be editable”, shortly after “Why can’t I just hack this stuff?” and “[...] if engineers can only see that biology is simply another substrate to hack”. Reused by the journalist, the term comes up later “degree in hand, Endy left school to hack more living stuff”<sup>45</sup>. Furthermore in the article Drew Endy explains “Biology just isn’t that hard. You just have to poke and prod and see what happens”. The exhortation, highlighted in red in the article, declassifies biology as a science but also suggest that “hack” when used in the context of biology becomes a “poke and prod” heuristic<sup>46</sup>. The informational and digital epistemology of biology<sup>47,48</sup> has again mutated to include the term “hack”. Also through the words of Drew Endy, engineering biology as a “hack” comes to sustain another ramification of making “There’s a visceral satisfaction to making a physical object. But the first time I cut and spliced a piece of DNA, I felt the same joy of making something. I was like, ‘Holy crap! It works!’”<sup>49</sup>. As the eleven pages that separate Drew Endy’s portrait and the Special Section: Backyard Biology, are filled with the usual *makers* portraits and projects, *backyard biology* simply becomes part of MAKE usual content. The nine *backyard biology* projects are spread among the five articles of the Special Section. Together the articles brings up-to-date a specific representation of science by promoting the figure of the *solitary* and anti-institutional scientist as a maker<sup>50, 51</sup>, in opposition to the institutionalized elitist experts not to be listen to<sup>52</sup>. Cryobiology is also portrayed as a transgressive

<sup>41</sup> Other than in reference to biological entities, MAKE is an important channel promoting the semantic displacement of the term “hack” to describe other activities that do not always involves electronics or informatics. A short but illustrative list of examples is given here: Curtain rings used to hang bananas becomes *banana hook hack* (P. Torrone, ‘Banana Hook Hack’, Make:magazine blog, 2006, viewed 18 October <<http://blog.makezine.com/archive/2006/11/banana-hook-hack.html>>), taking macro pictures by mating lenses together is referred as a *macro lens hack* (C. Culling, ‘How to – Macro lenses hack’, Make:magazine blog, 2008, viewed 18 October <<http://blog.makezine.com/archive/2008/09/how-to-macro-lens-hack.html>>) hack can be performed on knitting machines (J. Baichtal, ‘Gears of War Lego Hack’, Make:magazine blog, 2011, viewed 18 October, <<http://blog.makezine.com/archive/2011/10/gears-of-war-lego-hack.html>>), and Legos® can be used to hack (J. Baichtal, ‘Gears of War Lego Hack’, Make:magazine blog, 2011, viewed 18 October <<http://blog.makezine.com/archive/2011/10/gears-of-war-lego-hack.html>>).

<sup>42</sup> E. Drew, ‘Foundations for engineering biology’, *Nature* 438, 2005, pp. 449-453.

<sup>43</sup> E. Drew, ‘Synthetic biology: Can we make biology easy to engineer?’ *Industrial Biotechnology*, 2008, 4(4), pp. 340-351.

<sup>44</sup> H. Bügl, J. P Danner, R. J. Molinari, J. T. Mulligan, H. Park, B. Reichert, D. A. Roth, R. Wagner, B. Budowle R. M. Scripp, J. A. L Smith, S. J. Steele, G. Church & D. Endy ‘DNA synthesis and biological security’, *Nature Biotechnology*, 25, 2007, pp. 627 – 629.

<sup>45</sup> R. Parks, ‘Garage Biotech – For a safer world, Drew Endy wants everyone to engineer life from the ground up’, *Make:Magazine*, April 2006, pp. 42-45.

<sup>46</sup> E. Fox Keller, ‘The Biological Gaze’, in *Future Natural*. Ed. Sally Stafford. Routledge, 1995.

<sup>47</sup> J. D. Harraway J. ‘Gene: Maps and Portraits of Life Itself’, *Modest\_Witness@Second\_Millennium.FemaleMan@\_Meets\_Oncomouse™*, Routledge, 1997, pp. 131-173.

<sup>48</sup> E. Fox Keller, ‘Making Sense of life: Explaining Biological Development, Models, Metaphors and Machines’, Harvard Press, 2002, pp. 123-173.

<sup>49</sup> Parks, 2006.

<sup>50</sup> C. Platt, ‘Life and Death at Low Temperatures: How to freeze and revive garden snails’, *Make: Magazine*, April 2006, pp. 54 – 56.

<sup>51</sup> M. Kuniavski, ‘A sublime machine: Mike Wilder makes Lego robots for time-lapse 3D videos of carnivorous plants’, *Make:Magazine*, April 2006, pp 56 -58.

<sup>52</sup> Kuniavski, 2006.



activity *challenging conventional concepts* such as death<sup>53</sup>. Molecular biology unveils the *extraordinary and miraculous blueprint of life itself*<sup>54</sup>. The agency of horticulture is exhorted as *hack your plants! And play God in your garden*<sup>55</sup> and finally the use of mycology techniques to cultivate mushrooms is portrayed as a *cultural revolution*<sup>56</sup>.

By crafting terms such as *backyard cryobiologist*, a *backyard biologist* the authors also reclaim the possibility for the *everybody* of the journal's readership to become actors in the techno-scientific community. If reading and appreciating techno-scientific progress, in this case related to biology and reproducing fundamental experiments are classical pedagogical tool in the area of science vulgarization<sup>57</sup>, the authors propose a figure of experimental self-sufficiency relaying on gathering and assembling tools.

By focusing on the fabrication of research tools, while giving little information about how those tools are used and on what knowledge they relay, the *backyard biology* become a linguistic laboratory of self-sufficiency. As all the proposed activities are presented from the perspective of the *maker* agency, none of those projects would have previously been presented as a *backyard biology* activity. The imagery of the backyard is no more the one of a place where the *backyard biologist* can meet "living creatures with interesting stories to tell" but become a place of experimentation and production. There, life and death can be given or taken, wondrous plant growth is matched by being experienced through robotic 3D imagery, the blueprint of life itself can be, not only extracted and quantified with household products but also duplicated and analyzed<sup>58</sup>. Finally when the act of making is technologically weak, meaning it requires few tools as in the case of the grafting and hand pollination, it is reinforced by being called a *hack*.

As such the meaning of *backyard biology* is specifically extended, if outside MAKE, *backyard biology* activities are characterized by the act of observation, they now become through the use of the term "hack" a synonymous for intervention and experimentation.

This is not a *moral* argument trying to qualitatively position the differential value that the category of *backyard biology* is given to perform in MAKE. But a first attempt to describe how by inscribing pre-existing subjects such as cryobiology, molecular biology, horticulture and mycology as *backyard biology*, MAKE's editor extend the claim for the right of "adapting technology to our needs and integrating it into our lives" to biology at large. As *biology* is crafted into a subject of interests the *maker* generation, its experience needs to be med<sup>59</sup>iated by technological manipulations. It is from the backyard that biology enters the home and becomes a media for personal experimentation. As such, the yet not clearly localized device of the home laboratory becomes part, with the basement, the home workshop and the garage, of the American myth of homemade innovation. Additionally as the Backyard Biology issue was published two years before the first official meeting of the DIYbio network, its content can be understood as a discursive precursor to both the expansion of the term *hack* to living media and DIYbio network formative claim of "making biology an accessible pursuit for citizen scientists, amateur biologists and biological engineers who value openness and safety"<sup>60</sup>.

<sup>53</sup> Platt, 2006.

<sup>54</sup> C. Shawn, 'Kitchen Counter DNA Lab, Extract, purify, and experiment with the blue print of life', *Make:Magazine*, April 2006, pp 59 – 64.

<sup>55</sup> R. Luhn, 'Hack Your Plants! Play God in your garden - create custom fruits, flowers, veggies, and more', *Make: Magazine*, April 2006, pp 70 – 76.

<sup>56</sup> P. Ross, 'Home Mycology Lab', *Make:Magazine*, April 2006, pp 100 – 110.

<sup>57</sup> B. Schiele, D. Jacobi, 'La vulgarisation scientifique. Thèmes de recherche ', dans Daniel Jacobi et Bernard Schiele (dir.), *Vulgariser la science. Le procès de l'ignorance*, Seyssel, Champ Vallon, coll. " Milieux ", 1988, p. 12-46.

<sup>58</sup> J. Nakane, B. Keddie, P. Danielson, J. Fox, Y. Shirazu, D. Lee, E. Abd-Elmessih and D. Ng (UBC Advanced Molecular Biology Lab) 'Home Molecular Genetics: Extract, fingerprint, and replicate your DNA', *Make: Magazine*, April 2006, , pp 65 – 71.

<sup>59</sup> D. Dougherty, 'The Making of Make', *Make:Magazine*, January 2005, p.7.

<sup>60</sup> From DIYbio website main page, viewed 4 October 2011, <<http://diybio.org/>>

### Snapshot three: Maker Faire, DIYbio and the gathering of a public

This last section will briefly describes the role of Make Faires®'s community culture, in particular the importance of gathering to experience the act of making. Thereafter by presenting the progressive and enthusiastic participation of the DIYbio network's members to Make Faires®, this section explores how they came to belong the *maker* culture, and experience the *makers* as their public. Those descriptions are informed by preliminary interviews with members of the DIYBio network and participants observations of 2011 Newcastle and Bay Area's Maker Faires®.

The first Maker Faire®<sup>61</sup> took place on April 2006 on the San Mateo's Fairgrounds, at the hearth of the San Francisco Bay Area. Only five years later more than twenty Maker Faires® and Mini Maker Faires® have been organized among the USA, Canada, UK and Egypt. While according to the organizers this year original Bay Area Maker Faire was visited by more than 70'000 attenders.

On the event website, Maker Faire® is presented as “the premier event for grassroots American innovation. As the World's Largest DIY Festival, this two-day family friendly Faire has something for everyone - a showcase of invention, creativity and resourcefulness and a celebration of the Maker mindset”. Richard Metzger, a long lasting writer for Wired and Boing Boing, defined the Maker Faire as the “Woodstock of DIY”<sup>62</sup>.

After its first edition, in a short and personal report entitled “Genuine Ingenuity” and published in the MAKE issue “Backyard Biology”, Make Faire® founder Dale Dougherty, recalls his first intention was to simply bring the makers featured in the magazine “all together in one place”. Later in the article, the value of gathering is further developed:

“The new interest in DIY is more than just fun; it is part of a deeper search for authentic experiences, something our contemporary culture just doesn't offer enough of. Maker Faire was highly engaging. Unlike so many tech events, there was no one sitting in a corner with a computer checking email or Iming someone. Everyone was fully present, in body and spirit, kids and adults alike.”<sup>63</sup>

As isolated instant messaging (Iming) becomes an anecdotal fragment of what Dale Dougherty's critically experiences as a form of digital disembodiment, Maker Faires® community culture becomes its antidote. The fair organized around the communal core of the family, is where to experience the bonding experience of “grassroots American innovation”<sup>64</sup>.

It is at the occasion of the 2009 Bay Area edition, entitled “Re-Make America”, that Tito Jankowski a major actor of the then emerging Bay Area DIYbio network, had his first sign up for a booth accepted. Over two days Tito ended up supervising almost one thousands DNA extractions from visitors' saliva<sup>65</sup>. As Maker Faire® spread, local members of the DIYbio network became regular participants. Ten month later the second European Maker Faire was held at Life - Science's Centre, during the Newcastle Science Fest. This was the first occasion for two Europe based members DIYBio network, Brian Degger and Cathal Garvey to fiscally meet. They co-hosted a booth and proposed what had become iconic DNA extraction from kiwi with household's reagents. Brian, “a scientist, part time cryptozoologist, interdisciplinary researcher and artist”<sup>66</sup> constructed a DIY magnetic spinner at the table. As Cathal, a recently graduated student in genetics, was prevent by air company policies to bring

<sup>61</sup> As another example of MAKE use of language as a craft, is the choice of the term “faire” that in French can mean both to do and to make. Viewed 3 August 2011,  
<<http://ebmakerfaire.wordpress.com/tag/maker/>>

<sup>62</sup> Metzger, 2010.

<sup>63</sup> D. Dougherty, 'Genuine Ingenuity', Make:Magazine, January 2006, p. 48.

<sup>64</sup> Dougherty, 2006.

<sup>65</sup> Personal conversation, 15 October 2011.

<sup>66</sup> From Brian Degger personal web page, viewed 18 October 2011,  
<<http://transitlab.org/about>>

is bioluminescent bacteria over, he could only showcase the rotor of its first invention, the Dremelfuge<sup>67</sup> and his printed protocols explaining how to isolate luminescent bacteria from squids. Their proposition captured the attention of journalist from the BBC (British Broadcasting Corporation), who diffused the DNA extraction on their website<sup>68</sup>. In December of the same year, Cathal's Dremelfuge was also featured in a Make Blog in a post from Becky Stern, the Associate Editor and video producer for MAKE.

Two month later Bay Area DIYbio member held again a booth at the San Mateo Maker Faire. This time Tito Jankowski was in company of OpenPCR co-founder Josh Perfetto, a software engineer and autodidact biotechnologist. Through an SNP genotyping experience entitled "Hate Brussels Sprouts? Blame your genes!" they showcased the Open Gel Box 2.0<sup>69</sup> and the OpenPCR - Open Souce, hackable PCR machine<sup>70</sup>. Although they presented the first prototype, more than ten visitors signed up pre-orders for the OpenPCR, their motivation was boosted<sup>71</sup>. At the booth nearby, Ery Gentry and Joseph Jackson co-founder of Biocurious - "the Bay Area biology collaborative lab space" distributed leaflets presenting the project at its early stage and collecting new members.

In the autumn of the same year, three members of the DIYbio NYC network were invited by Ben Dubin-Thaler funder of the Biobus<sup>72</sup> to participate to the World Maker Faire, held at the New York Hall of Science. Dan, Russ and Ellen invited visitors to participate to their "DNA extraction Party" where they could extract DNA from strawberries. An account of the activity was published on Make:magazine Blog<sup>73</sup> by Ery Gentry<sup>74</sup>. As Genspace member recall their participation to the event, Dan mentions, "I remember how amazing it felt to join this group of makers. A home coming of sorts."<sup>75</sup>

This year members of the DIYbio network participated at least to five different Maker Faires®, respectively in Newcastle, Bay Area, New York, Brighton and Cairo.

As Cathal left 2010 Newcastle's Maker Faire® with the impression he didn't showed much, " next Maker Faire I said no, let's do this properly I have more time to prepare – and the next year we had a load of stuff on the table "<sup>76</sup>. The organizers sign presenting the booth entitled "DIYbio/IndieBiotech". The short text mentioned "you can learn to grow some awesome microbes using only equipment and ingredients from your department store. Perhaps the next Radioshack will be "Bioshack"?". Wearing a thick pair of red rubber gloves and casual cloths, Cathal *the maker* displayed the essential elements of

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<sup>67</sup> Upgrading Dremel renowned versatility, Cathal designed rotor with open source software CAD, 3D printed it with his Makebot, screwed it to the spinning head of his Dremelfuge and used is as centrifuge.

<sup>68</sup> M. Ward, 'Tech Know: Life hacking with 3D printing and DIY DNA kits', *Live BBC New Channel*, March 2010 , viewed 17 October 2011,  
<<http://news.bbc.co.uk/1/hi/technology/8595734.stm>>

<sup>69</sup> The Open Gel Box is an open source hardware used to migrate agar gels. Viewed October 2011,  
<<http://www.pearlbiotech.com>>

<sup>70</sup> The OpenPCR is an open source hardware used to produce the poly chain reaction (PCR), a chemical reaction used to duplicate sample of DNA. Viewed 12 October 2011,  
<<http://openpcr.org/>>

<sup>71</sup> Personal conversation, June 2011.

<sup>72</sup> Biobus is "a high-tech laboratory on wheels" aimed to bring "hands-on science education to communities that rarely have such opportunities", viewed 2 October 2011,  
<<http://biobus.org/about-us/>>

<sup>73</sup> Since September 2010, Ery and Tito were invited to regularly post on Make Blog as Citizen Science Guest Authors. Ery and Tito blog post on Make Blog has since also included announcement for events taking place at Biocurious, viewed 11 October 2011,  
<[http://blog.makezine.com/archive/author/tito\\_jankowski](http://blog.makezine.com/archive/author/tito_jankowski)>

<sup>74</sup> G. Ery, "DIYbio NYC on the Biobus", Make:magazine Blog, 2010, viewed 3 September 2011,  
<<http://blog.makezine.com/archive/2010/10/diybio-nyc-on-the-biobus-1.html>>

<sup>75</sup> Personal conversation, 12 October 2011

<sup>76</sup> Interview, 29.11.2011

his own home made laboratory. Under his sterile homemade hood<sup>77</sup>, participants were invited to inoculate a potato starch media petri dish with a culture of DIYbio model organism *bacillus subtilis*<sup>78</sup>. As Cathal recalls his last Maker Faire®'s favorite moments, he explains:

“Where the message of DIYbio which is probably the wrong message to say “you can do science too!”, I think a better message is what MAKE scene is doing as a start, to no even mentioning the word science, let's do DNA extraction, let's sequence your DNA, let's hack that bacteria, let's program that petunia, it is not science it is hacking, it is making, it is playing, it is fun”<sup>79</sup>.

From his participation to what he calls the *MAKE scene*, Cathal realizes that by removing the word science or stereotypical representations such as the lab coat, he could allow visitors to experience science, and in particular microbiology and genetics as common, normal and belonging to the familiar space of the house.

This year Bay Area Mateo Maker Faire was entitled “Take the world in your hand” . DIYbio presence and proposition was larger and more sophisticated. Under the new title “explore the world of biotech on your desktop!”, Tito and co-founder Josh presented their progress on the almost ready to ship OpenPCR . They didn't proposed any experiment but they advertised their first social outreach project. The “7 Days 7 Schools” initiative, aimed to raise money to deliver 7 OpenPCR machines in schools around the world. In respect to his participation to Maker Faires Tito felt that although other attenders interest were different, they all shared the same level of passion, while he couldn't felt the same at the events focused on biology that he attended<sup>80</sup>

At the adjacent booth five funding members of BioCurious, rebranded “a hacker space for biotechnology”, proposed to observe slides of mouse brain tissue, worms and onion skin under the microscope, to test the production of electricity from a Winogradsky columns and to win free classes at BioCurious by taking a picture in an empty hole of the “Mad Scientist Hall of Fame”. At the end of the day Biocurious was given the Maker Faire Education Award<sup>81</sup> and a couple of month later a video-interview of Ery Gentry presenting Biocurious at the Maker Faire was posted in Make:magazine Blog<sup>82</sup>. Ery's motivations were tainted with pragmatism: “I was told Maker Faire was a good way to expose many people to Biocurious. Since it was important to get support, I went”, also she thought that their proposition was “atypical but fits in, as it is diy and the audience seems to embrace science and hackerspaces”<sup>83</sup>.

Finally last month GenSpace was invited to Maker Faire Cairo, the third event of the Maker Faire Africa series. There Ellen, Oliver and Sung (two other co-founder of Genspace) proposed two three our long workshops and a talk. The workshop proposed to practice personal genotype using Singular Nucleotide Polymorphism sequences and build *hacked biotech equipment*. While the talk presented preliminary work on software aimed to facilitate the downloading and use of sequences from the

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<sup>77</sup> Cathal produced the home made hood by following the instruction in Phi “Home Mycobiology Lab” project by Phillip Russ. Personal conversation 19 October 2011.

<sup>78</sup> After the first discussions on the DIYbio Google Group about which would be the DIYbio model organism, Cathal started to advocate that in the case of microorganism's *bacillus subtilis* would have been the best candidate. Do not mention this in the paper The choice of *Bacillus subtilis* was related to Cathal conviction that this would be a much more safer and better model organisms for the DIYbio community, he was also promoting his upcoming work on an open source plasmid the Indie Backbone or IndieBB (he just sent the design to be synthesized) that would have been the cloning vector for the bacillus subtilis model DIYbio organisms.

<sup>79</sup> Interview, 29.11.2011

<sup>80</sup> Personal conversation, October 2011.

<sup>81</sup> Personal conversation, May 2011.

<sup>82</sup> M Brokelynn, 'Biocurious: Eri Gentry', 2011, On Maker blog, 6 October 2011, viewed 7 October 2011 <<http://blog.makezine.com/archive/2011/10/biocurious-eri-gentry.html>>

<sup>83</sup> Personal conversation, October 2011.

BioBrick registry. Sung an undergraduate students in physics, recalls “Well preparing for that event was actually the trial by fire of belonging to DIYbio” but also that “Genspace participation in Maker Faire was a great idea. I felt like we really belong there”<sup>84</sup>.

While Oliver who could only participate to Maker Faire Africa, in Cairo mentioned “Maker Faire is more like a science festival – flea market”. Later while speaking about his relation to the *maker* movement he expressed:

“I wish I was a maker, I wish I had my workshop outside Genspace, I wish I was tinkering out more, building my own car, it is ingrained in American culture, and I appreciate the movement. That whole core principle of self-sufficiency it is a very protestant American core principle and in that sense I think it is immensely positive”<sup>85</sup>.

Similarly to how Fred Turner describes the Burning Man (which many statues and installations are also showcased at Maker Faire) with the expression “the festival becomes the factory”, Maker Faire is both a science and technology festival, a family market, and a forum where social networks are formed and performs once attendees goes back to their daily life<sup>86</sup>. The 'individual consciousness' becomes collective<sup>87</sup>.

Although DIYbio members have participated to numerous other events; Maker Faires have become a reference. From their participation they receive immediate benefits such as: being an occasion where to physically meet and receive media coverage, but also attract new members and showcase their product in development to get financial support.

More importantly, in the course of their participation, members of the DIYbio network comes to share with their peers the artefacts they have manufactured and they learn how to narrate their meaning so to engage *makers*. As pointed out by Jennifer Reardon in the case of the politics of personal genomics (Reardon, 2011), DIYbio network members are similarly struggling to define who is the « persons » and the « biologies » in personal biology<sup>88</sup>. In this moment of uncertainty, *makers* become a referential public through which DIYbio members can exercise their vision of a personal biology open to everyone.

## Conclusion

Rather than recapitulating, this last section will propose to contextualize this paper’s preliminary observations as part of this special issue theme: “expanding the frontiers of hacking”. As the content analysis of MAKE’s the Backyard Biology issue illustrate, the magazine, as an information technology is at least one precursor in constituting and diffusing a representation of biology as “hackable”. This representation participates to the redefinition of the *backyard biology* category. Biology as a technology is framed, perpetuating and actualizing the Whole Earth Catalog and lately digital generation’s techno-libertarian tradition, as personal technology for 'individual consciousness' <sup>89</sup>. But more importantly as this new representation emerges it is immediately reabsorbed as part of the figure of the *maker*. The *maker* becomes a federative imagery in which the techno-libertarian vision of personal technologies as tools for social change and the American middle class romantic vision of DIY as homemade innovation and self-sufficiency come once more to coexist.

While the expansion of the frontiers of hacking, as described in Otto von Bush and Karl Palmas work,

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<sup>84</sup> Personal conversation, October 2011.

<sup>85</sup> Personal conversation, October 2011.

<sup>86</sup> F. Turner, 'Burning Man at Google: a cultural infrastructure for new media production' in *New Media Society*, 11, 73, 2009, p. 89, SAGE.

<sup>87</sup> Turner, 2006, pp 73-78.

<sup>88</sup> J. Reardon, “The 'persons' and the 'genomics' of personal genomics”, *Personalized Medicine* 8(1), 2011, pp. 95-107.

<sup>89</sup> Turner, 2006, pp 73-78.

is understood as a contemporary critique of the "dominant technologies". The critique is not only characterized by the necessity to acquire an active ownership of the technology but it requires to understand the technology's politics of production and its influence over the organization of the social<sup>90</sup>. In this respect the actualization of the techno-libertarian ideal as it infuses the figure of the *maker* and the *modern DIY* activities it gathers, is still embedded in the Californian grassroots innovation culture<sup>91</sup>. As the DIYbio network members recognize themselves as *makers*, they bound to the vision of biology as a personal technology, by becoming an important vehicle of the expanding representation of biology as "hackable".

Crafting the expression, Sub(O)bject Make(R)s in reference to MAKE' editorial culture and Maker Faire community culture, is a conclusive attempt to linguistically enclose the recursive politics of a social group where subjects are valued in relation to the specific objects they manufacture, and where biology also become a tool for the manufacturing of subjectivities.

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<sup>90</sup> O. Von Bush, K. Palmas, 'Abstract haktivism, the making of a hacker culture', 2008  
<[http://www.isk-gbg.org/abstracthactivism/?page\\_id=2](http://www.isk-gbg.org/abstracthactivism/?page_id=2)>

<sup>91</sup> J. Heath, A. Potter, 'The rebel Sell: how counter culture became consumer culture': Capstone, Leicester, 2005